

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022
(Fourth Semester)

Branch – MATHEMATICS

MATHEMATICAL STATISTICS - II

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 1 = 10)

- 1 Stratified sampling belongs to the category _____.
(i) Judgment sampling (ii) Subjective sampling
(iii) Controlled sampling (iv) Non – random sampling
- 2 The concept of consistency, efficiency and sufficiency are due to _____.
(i) J Neyman (ii) R A Fisher
(iii) C R Rao (iv) J Berkson
- 3 An estimator is considered to the best if its distribution is _____.
(i) Continuous (ii) discrete
(iii) Concentrated about the three parameter (iv) Normal
- 4 If x_1, x_2, \dots, x_n is a random sample from a population $N(0, \sigma^2)$, the sufficient statistic for σ^2 is _____.
(i) $\sum x_i$ (ii) $\sum x_i^2$ (iii) $(\sum x_i)^2$ (iv) x_i
- 5 The credit of inventing the method of moments for estimating the parameters goes to _____.
(i) R A Fisher (ii) J Neyman
(iii) Raplace (iv) Karl Pearson
- 6 The Minimum variance approach was put forth by _____.
(i) Gauss (ii) Markov
(iii) Fisher (iv) Rao - Blackwell
- 7 Level of significance is the probability of _____.
(i) Type I error (ii) Type II error
(iii) not committing error (iv) committing both the error
- 8 Size of critical regions is known as _____.
(i) power of the test (ii) size of type II error
(iii) critical value (iv) size of the test
- 9 The hypothesis that the population variance has a specified value can be testes as _____.
(i) F-test (ii) (iii) χ^2 test (iv) t – test
- 10 Degrees of freedom for statistic (χ^2) in case of contingency table of order (2x2) is _____.
(i) 3 (ii) 4 (iii) 2 (iv) 1

Cont...

SECTION - B (35 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 7 = 35)

- 11 a Write a short note on (i) stratified sampling and (ii) systematic sampling.

OR

- b Fit a straight line to the following data:

X:	1	2	3	4	6	8
Y:	2.4	3	3.6	4	5	6

- 12 a Prove the invariance property of consistent estimation.

OR

- b State Cramer – Rao inequality and give its regularity conditions.

- 13 a Explain briefly about likelihood function and maximum likelihood estimator.

OR

- b Write briefly about method of moments.

- 14 a Explain (i) simple and composite hypothesis and (ii) null and alternative hypothesis.

OR

- b Let P be the probability that a coin will fall head in a single toss in order to test $H_0: P = \frac{1}{2}$ against $H_1: P = \frac{3}{4}$. The coin is tossed 5 times and H_0 is rejected if more than 3 heads are obtained. Find Probability of type I error and power of the test.

- 15 a The height of 10 males of a given locality are found to be 70,67,62,68,61,68,70,64,64,66 inches. It is reasonable to believe that the average height is greater than 64 inches? Test at 5% signification level assuming that for 9 d.f.

OR

- b Two sample polls of votes for two candidates A and B for a public office are taken, one from among the residents of rural areas. The results are given in the adjoining table.

Area	Votes	
	A	B
Rural	620	380
Urban	550	450
Total	1170	830

Examine whether the nature of the area is related to voting preference in their election.

SECTION - C (30 Marks)Answer any **THREE** Questions**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

- 16 Fit an exponential curve of the form
- $y = ab^x$
- to the following data:

X:	1	2	3	4	5	6	7	8
Y:	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

- 17 Prove Rao – Blackwell Theorem.

- 18 In random sampling from normal population
- $(N(\mu, \sigma^2))$
- Find MLE for (i)
- μ
- when
- σ^2
- known (ii)
- σ^2
- when
- μ
- is known.

- 19 If
- $x \geq 1$
- , is the critical region for testing
- $H_0: \theta = 2$
- against
- $H_1: \theta = 1$
- on the basis observation from the population
- $f(x, \theta) = \sigma \exp(-\sigma x); 0 \leq x < \infty$
- obtain values of types I and type II errors.

- 20 Out of 8000 graduates in a town of 800 females, out of 1600 graduate employees 120 are females. Use
- χ^2
- to determine if any distinction is made in appointment on basis of sex.
- χ^2
- at 5% level for 1.d.f is 3.84.

Z-Z-Z

END